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ABSTRACT

Presented is a description of the development and use of a technical system designed to provide students (in this case, engineering students) situated at remote sites a means for better interaction with their instructors. For example, students at such sites cannot get their immediate questions answered because of the physical location of their instructor. Several systems are described in which the instructors visit the remote sites at least one or two times during a given course but at the time of this study, it indicated that no student-oriented audiographic feedback system was being used. The system described, referred to as the remote Q-A unit, consists of a slow scan television (SSTV) camera, a TV monitor, a slow-to-fast scan converter, and an audio tape recorder. This system allows storage of information on audio tape for later presentation. The low date rate of the SSTV allows graphic information to be transmitted over conventional telephone circuits. Goals and plans for use of the Q-A unit are presented. Features and advantages of the system are listed. (EB)

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AN EXPERIMENTAL REMOTE QUESTION - ANSWER SCAN TELEVISION AND STUDENT EVALUATION SYSTEM

BY

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One of the pressing problems which exists when one attempts to teach technical material to students at remote areas is that of communications. The instructor normally can use video types or other educational media to communicate information about course material to the student. However, unless the instructor is able to have face-to-face contact with the student, it is difficult for the student to communicate his problems to the instructor. It is particularly important in technical problem solving that the student is able to present his problem graphically as well as orally. In an urban environment the student may have immediate access to a peer either from the institution offering the material or from individuals at the site where the educational materials are being used. Peer access is not as readily available in many remote regions, such as the intermountain region.

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The need for student feedback has been accomplished using three differenct approaches. Kriegel in his paper points out that in existing educational systems the student can feedback questions to the institution by : a) telephone conservations with the instructor; b) on-site visits of the instructor; and c) remote audio feedback during live lectures.

Although a difference of opinion does exist, all existing off-campus programs recognize the importance of feedback in the educational environment of the student. For example the Colorado CO-TIE makes use of on-site instructors as well as blackboard-by-wire facilities. The SURGE program makes use of telephone conversations and on-site visits by the instructor to facilitate feedback from students. Other systems such as the GENESYS make use of audio feedback over a microwave link to facilitate student-teacher interaction.

Virtually all systems have the instructor visit the remote sites at least one or two times during the course. It appears that at the present no student-oriented audio-graphic feedback system is being used. The use of SSTV as an educational tool is not new. The Copper Country School District has instituted an SSTV system for education, project CO-TIE also used SSTV. The equipment used in the Copper Country system is much more elaborate than is

necessary for a simple feedback Q-A system. The basic concept of recording graphic and audio information for use at a later time has been done at MIT with an Interactive Lecture by Electrowriter.

Because of the geography of the intermountain regions it is difficult, if not impossible, for the instructor and student to meet more than every other week at best, and in some cases this frequency of meetings is not possible.

In some remote engineering programs in the region the telephone has been used to help the student fill in between visits of the instructor. The telephone will allow voice communications, but it will not solve the visual presentation. There is also a problem of insuring that the student and professor are both near the telephone when the student has a problem.

A remote question and answer (Q-A) unit using SSTV will be used to implement the desired feedback. Economics and educational benefits will be evaluated. Formats and procedures will be established so that any type of graphical aid can be used.

THE PRESENT REMOTE PROGRAM:

In the past three years engineering graduate level teaching programs have been run at several remote sites around the Intermountain Region my members of the Consortium. One of the common complaints voiced by

students at these sites is that they cannot get their "immediate" questions answered because of the physical location of the instructor. It is the feeling of these students that their understanding of the material presented at these remote sites would be greatly aided by a system which would allow them to interact with the instructor.

In most cases there is approximately two weeks between the time a student receives instructional material and the time when the instructor visits him. In this period of time the unanswered question that the student had during his previous work may impede his educational progress. It is anticipated that the Q-A unit will fill in between visits of the instructor and provide a method for the student to orally and graphically present his technical problems.

THE REMOTE Q-A UNIT:

The remote Q-A unit will consist of a slow scan TV (SSTV) camera, an TV monitor, a slow-to-fast scan converter and an audio tape recorder. By using SSTV it is possible to store information on the audio tape for later presentation. The low date rate of the SSTV allows graphic information to be transmitted over conventional telephone circuits.

The Q-A unit will require data storage at both the transmitter and the receiver. This allows recording audio and graphic data in real time and transmitting this recorded data at a rate slower than real time which will conserve bandwidth. The storage units will be magnetic tape cassette units. The graphic information and audio information will be recorded using the two tracks of the tape unit. The tape unit will be run at regular speed during the recording and playback of the information. During transmission of information over the phone lines the tape unit will run at regular speed and one track transmitted over the telephone at a time. Thus, a two-minute graphic audio conversation would take four minutes to transmit.

The student at the remote site would originate a question, both graphically and orally, put the question on the remote Q-A unit and transmit it to the instructor. The instructor would play the tapes, formulate the reply to the question and transmit this information to the student. It would be noted that clerical help could be used to tape the incoming questions and the instructor could answer the questions as time permits.

The basic advantage of this type of activity is that the student could get a reply to a question with a minimum of delay. Another advantage of the proposal is that the

questions can be taken when the instructor is doing other productive work and the replies made to these questions at the instructor's leisure.

HARDWARE:

The remote Q-A system will consist of four major components. An SSTV scan converter, TV monitor, an SSTV camera and an audio tape recorder. These components will be located at the remote site as well as on campus.

The SSTV scan converter and SSTV camera will be used to generate in the appropriate format the graphical data. The scan converter will be used to increase the resolution of the SSTV signal and display it on a conventional TV monitor. The SSTV signal will be fed to a tape recorder for transmission over phone lines in a sequential manner.

The precedure for use of the Q-A system is relatively straightforward. The student would formulate his problem in a prescribed format and record both the SSTV signal and the audio signal (one on each track of the tape) on the cassette. At the end of his presentation he would phone the instructor and the instructor would connect his tape deck to the phone. The student would then play sequentially to the instructor

the audio and video portion of his problem. In reply to the student's questions the instructor will reverse the procedure that the student used to transmit the question.

GOALS AND PLANS FOR USE OF THE Q-A UNIT:

A) Establish a format that will allow the students to ask questions in such a way that direct intervention of the instructor is unnecessary. The format of the question asking will be machine (SSTV) independent.

B) Models of the feedback process will be studied and the students at the remote sites will be evaluated and compared with on-campus students.

C) Economic mcdels of the feedback process will be considered.

D) Slide tape short courses with Q-A capability will be instituted.

The plan for realizing these goals is relatively straightforward and will be discussed sequentially.

The format which will be developed will be of such a nature as to force the student to graphically illustrate his problem as well as orally express his problem. This will be accomplished by two means. The first is by demonstration of a technique to ask questions. This will be done using the SSTV as a teaching tool and material

presented to demonstrate the question-answering methods. The second technique which will be developed is a set of written instructions which when completed will allow the student to present his problem in a clear and concise manner.

Models of the feedback process will be developed by comparing students at remote sites with those on-campus. Evaluation will be done before students take a course using methods developed in cooperation with MIT. Periodic sampling of the students will be made during the semester and formats developed by MIT will be used as much as possible in this sampling process.

The attitude of the off-campus student will be monitored using relatively simple questions about his attitude toward the course and the Q-A system.

The economic model of the Q-A system will take into account the distance of students from university and the number of students at remote sites.

EDUCATIONAL AND INSTRUCTOR EFFICIENCY WILL ALSO BE CONSIDERED:

In addition to serving as a remote question-answering unit, the proposed system could be used for running short courses on an individual basis. To do this, all that would be necessary is to present the material in slide-tape format. This feature could be

used for EIT review and review at the graduate level of specific technical topics such as Laplace transforms, Z-transforms, etc. Mini-courses on instrumentation and computers could also be run for high school teachers during the summer using this equipment.

The materials and procedures which will be developed in conjunction with the Q-A system will be available to members of the consortium. It is anticipated that, when economically possible, Q-A systems will be employed by the consortium participants. It is anticipated that the most economical method of using the SSTV system will be in the slide tape mode with the Q-A mode as a support feature. Procedures which are developed for the evaluation of students and the effect of the Q-A system will be made available to the consortium as well as other interested parties.

FEATURES AND ADVANTAGES OF THE Q-A UNIT:

1. Students and instructor are not restricted to any fixed schedule in order to confer.
2. Graphical as well as audio information can be transmitted to and from the student.
3. The audio and graphical data can be stored and transmitted when the telephone rates are low and/or when the WATS lines are open.

4. Data can be stored at the receiver and played back; the replies can be made when the instructor has time.
5. An effective Q-A system will reduce the number of trips required by the students. This would save both faculty time and energy resources.
6. Reducing the amount of instructor travel time, remote programs can be made more cost effective.
7. The student should not experience the confusion and frustration he does at the present time. Thus, the effectiveness of his learning will improve.
8. Short courses could be run with a slide tape format using the Q-A system and have the capability of student question and answer activity.